
Chapter Six

AGRICULTURAL RUNOFF

Summary of Findings

1. *Monitoring of agricultural runoff impacts -- and of nonpoint source pollution in general -- is inadequate, largely because of insufficient funding and also because of the relative newness of nonpoint source management strategies.*
2. *Management agencies remain cautious about nonpoint source control strategies because of a continuing "knowledge gap."*
3. *Irrigation return flows are a source of agricultural runoff that still must be brought under regulatory control.*
4. *A basic management framework for addressing agricultural nonpoint source pollution is in place, although there sometimes is uncertainty as to whether water quality agencies or agriculture agencies should take the lead.*
5. *Sediment loadings will continue to be addressed through erosion control programs, but they are not a high priority of nonpoint source programs aimed at agricultural runoff.*
6. *The Texas Soil and Water Conservation Board has made substantial progress toward identifying Best Management Practices that are effective in controlling the nonpoint source impacts of agriculture and silviculture.*
7. *The effectiveness of management programs for agricultural runoff ultimately depends on the cooperativeness of rural landowners.*

Responsibility for management of agricultural runoff and its impacts is dispersed among a number of agencies. This reflects the range of regulatory concerns that overlap with and are encompassed by "agricultural runoff." The U.S. Environmental Protection Agency and the Texas Water Commission are involved as water quality agencies and as regulators of pesticides and other agricultural chemicals. The U.S. Soil Conservation Service, the U.S. Agricultural Stabilization and Conservation Service, and the Texas Soil

and Water Conservation Board are involved because of their expertise in soil erosion prevention. The Texas Department of Agriculture, the Texas Agricultural Extension Service and similar agencies are involved for all of these reasons -- water quality, chemical safety, and soil conservation -- in addition to their central responsibility for agricultural welfare in Texas. Some of these management agencies still address agricultural runoff problems from a reactive position, partly because of other priorities and also due to their limited knowledge and resources. Other agencies such as the Soil and Water Conservation Board have been successful through an active approach that emphasizes pollution prevention and use of Best Management Practices.

Effective coordination is essential in an area of regulation that potentially can involve so many diverse agencies. But the primary concern of these agencies is adequate funding support for their programs. While the water quality agencies are still preparing for comprehensive nonpoint source regulation and management, agriculture and soil conservation agencies have developed their nonpoint source strategies based on successful past approaches to soil conservation on agricultural land. The agencies hope for a secure funding source for nonpoint source programs in coming years that will allow for more effective and comprehensive implementation. But, as in the point source area, they are concerned to see cuts being made in existing programs, even before new nonpoint source responsibilities have been added.

Action Recommendations

Action: *The involved agencies should continue to emphasize Best Management Practices (BMPs) and cooperative pollution abatement efforts with individual landowners.*

Involved Agencies:

- Waters Davis Soil & Water Conservation District
- Texas Agricultural Extension Service
- Texas Soil and Water Conservation Board
- U.S. Soil Conservation Service
- Texas Department of Agriculture
- Texas Water Commission

Rationale: Agency managers and staff know that they can take advantage of an existing network of personal contacts and voluntary partnerships for soil conservation and agricultural assistance. The agencies should continue to work through these face-to-face channels. They also should weigh the benefits of sponsoring periodic (perhaps annual) countywide workshops on runoff controls and Best Management Practices to give the initiative a higher profile among all county residents and elected officials. An important element of a BMP implementation effort should be consideration of the need for technical and financial assistance to individual landowners. The agencies also should stress improved

monitoring and reporting on BMP implementation, at least within the targeted coastal preserve area.

Action: *The involved agencies should work together, under the lead of the Texas Soil and Water Conservation Board and the Texas Water Commission, to develop a comprehensive monitoring strategy geared to agricultural runoff for Christmas Bay and its tributaries.*

Involved Agencies:

- Texas Soil and Water Conservation Board
- Texas Water Commission
- U.S. Geological Survey
- U.S. Environmental Protection Agency
- Waters Davis Soil & Water Conservation District
- Texas Agricultural Extension Service
- Texas Agricultural Experiment Station
- U.S. Soil Conservation Service
- Texas Parks and Wildlife Department
- Texas Department of Health
- Texas General Land Office

Rationale: As with point source monitoring, the involved agencies should establish consensus monitoring objectives for the coastal preserve and evaluate the potential cost of meeting their data collection needs. A comprehensive, coordinated strategy should indicate the location of sampling points, the techniques to be used, and the frequency of monitoring. Procedures also should be in place for sharing and exchange of monitoring data. The strategy for monitoring agricultural runoff impacts should overlap as much as possible with existing and proposed methods for point source and ambient water quality monitoring within the preserve.

Action: *Christmas Bay and its tributaries should be the focus of targeted research on agricultural runoff and its impacts.*

Involved Agencies:

- Texas Soil and Water Conservation Board
- Texas Water Commission
- Texas Agricultural Experiment Station
- Waters Davis Soil & Water Conservation District
- U.S. Soil Conservation Service
- Texas Agricultural Extension Service
- Texas Department of Agriculture
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- Texas Parks and Wildlife Department

Rationale: An intensive study of nonpoint source problems and concerns in the vicinity of Christmas Bay should be sponsored. The Texas Soil and Water Conservation Board conducted a similar study of Dickinson Bayou in neighboring Galveston County in 1987 as part of the statewide nonpoint source assessment for the federal government. A study of the Christmas Bay area would touch on many of the same topics: rice farming and irrigation, irrigation supply canals, return flow ditches and conveyances, pastureland, oil and gas development, and initial residential development and urbanization impacts in rural areas. It should also determine whether increased turbidity and/or introduction of contaminants from sediments is enough of a problem in Christmas Bay to justify specific efforts to control upstream sediment loadings (e.g., higher turbidity may affect the Bay's seagrasses). Such an investigation should result in "localized" Best Management Practices for the specific areas adjacent to Christmas Bay. In addition to this targeted research, the involved agencies should view the Christmas Bay watershed as a "proving ground" for various techniques and management options. For example, the Texas Department of Agriculture might test its "integrated pest management" strategies in or near coastal preserve areas where agricultural chemical use is a concern. Water quality agencies might evaluate various monitoring options by testing them in coastal preserve waters. Agricultural operations near Christmas Bay might be used as BMP demonstration sites for educational and research purposes. This could include projects which test various retention and recirculation options for irrigation water used in rice farming.

Action: *The agencies involved in agricultural runoff management and research should explore ways to maximize coordination of their activities.*

Involved Agencies:

- Waters Davis Soil & Water Conservation District
- Texas Agricultural Extension Service
- Texas Agricultural Experiment Station
- Texas Soil and Water Conservation Board
- Texas Department of Agriculture
- Texas Water Commission
- U.S. Environmental Protection Agency

Rationale: As is clear from the lists of involved agencies included in this chapter, numerous entities have a potential role to play in management of agricultural runoff. The state benefits from having a clear lead agency for rural nonpoint source issues in the Texas Soil and Water Conservation Board. The Board and the Texas Water Commission have developed an effective working

relationship through the statewide nonpoint source assessment process. The challenge for these lead agencies is to integrate the expertise and potential contributions of the numerous other agencies into a coordinated nonpoint source management strategy. Coastal preserves might be used as a starting point for developing "pilot" management programs. Aside from coordinating their routine activities in coastal preserve areas, the involved agencies should assist in recommending program priorities in light of limited resources. Coordinated management also should lead to improved procedures for sharing data and reporting observed problems to the appropriate agency. The lead agencies should consider a periodic status report, perhaps in line with the biennial state water quality inventory, to summarize findings, innovative projects, and management successes within the coastal preserve.

**Christmas Bay Management Framework:
AGRICULTURAL RUNOFF**

AGENCY	AUTHORITY	POLICY	STRATEGY	ACTORS
SWCB	1. Texas Agriculture Code, Chapter 201	1. State Soil and Water Conservation Board	1. Texas Agricultural and Silvicultural Nonpoint Source Management Program 2. Nonpoint Source Coordinating Committee 3. <u>Statewide Control Strategy for Agricultural Nonpoint Source Pollution in Texas:</u> - Agricultural Best Management Practices (BMPs) 3. NPS monitoring and assessment in agricultural and silvicultural areas 4. Inter-agency coordination of technical assistance and public information/education	1. State Soil and Water Conservation Board personnel (Temple) 2. Waters Davis Soil and Water Conservation District (Angleton) 3. District Conservationist

**Christmas Bay Management Framework:
AGRICULTURAL RUNOFF**

AGENCY	AUTHORITY	POLICY	STRATEGY	ACTORS
TWC	<ol style="list-style-type: none"> 1. Texas Water Code, Chapter 26 2. Texas Health and Safety Code, Chapter 361 (Texas Solid Waste Disposal Act) 	<ol style="list-style-type: none"> 1. Texas Water Commission 	<ol style="list-style-type: none"> 1. State Surface Water Quality Standards: - Antidegradation Policy 2. Texas Nonpoint Source Management Program: - BMP development 3. State Water Quality Monitoring Network 4. Texas Groundwater Protection Committee: - Texas Groundwater Protection Strategy 5. Pesticide regulations, investigation and enforcement 6. Special studies and assessments of nonpoint source loadings 7. Permitting and Rules for Livestock and Poultry Production Operations 	<ol style="list-style-type: none"> 1. Water Quality Standards and Evaluation Section 2. Groundwater Conservation Section 3. Hazardous and Solid Waste Division 4. District 7 Field Office (Houston)

**Christmas Bay Management Framework:
AGRICULTURAL RUNOFF**

AGENCY	AUTHORITY	POLICY	STRATEGY	ACTORS
TDA	1. Texas Agriculture Code: - Chapters 11 - 12 - Chapter 75 (Texas Herbicide Law) - Chapter 76 (Texas Pesticide Control Act)	1. Texas Commissioner of Agriculture	1. Texas Pesticide Regulations: - pesticide evaluation and registration - use restrictions, advisories - labeling requirements - licensing of dealers and applicators 2. Texas Herbicide Regulations 3. Groundwater Protection Rules 4. Investigations of complaints and regulatory violations 5. TDA/EPA Pesticide Enforcement Cooperative Agreement 6. Pesticide use surveys 7. Rural Drinking Water Monitoring Project 8. Agricultural BMPs 9. Groundwater Technical Advisory Group (inter-agency)	1. Texas Commissioner of Agriculture 2. TDA Office of Natural Resources 3. TDA Pest Management Program 4. Coastal Bend District Office (Houston)

**Christmas Bay Management Framework:
AGRICULTURAL RUNOFF**

AGENCY	AUTHORITY	POLICY	STRATEGY	ACTORS
EPA	<ol style="list-style-type: none"> 1. Federal Water Pollution Control Act amendments (Clean Water Act): - Water Quality Act of 1987 2. Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) 	<ol style="list-style-type: none"> 1. U.S. Congress 2. EPA Administrator 3. Regional Administrator, Region 6 	<ol style="list-style-type: none"> 1. Oversight and guidance of state water quality management planning 2. Approval and oversight of Texas Nonpoint Source Management Program 3. Groundwater Protection Strategy: - wellhead protection programs 4. Funding assistance programs for NPS management 5. Nonpoint source pollution research and education: - National Pesticide Survey 6. Pesticide regulations, investigation and enforcement 7. EPA/TDA Pesticide Enforcement Cooperative Agreement 8. Federal and state inter-agency coordination 	<ol style="list-style-type: none"> 1. Water Management Division (Dallas) 2. Office of Groundwater Protection 3. Pesticides and Toxics Branch (Air, Pesticides, and Toxics Division)

Management Concern: AGRICULTURAL RUNOFF

Background

The nation's water resources continue to be impacted by the tools and byproducts of agriculture: pesticides, herbicides, fertilizers, animal waste, oil and grease from farm equipment, and sediments generated from routine land disturbance. The existing regulatory framework is still not fully equipped to address these "nonpoint source" impacts effectively. Experts say that there is a lack of consistent, comprehensive data on the impacts of agricultural activity on nearby waters. The fiscal and political pressures confronting government can even lead to contradictory regulatory policies. For example, polluted urban stormwater, long included under the broad umbrella of nonpoint source pollution, now has been brought under the NPDES program since regulators are focusing on the eventual point sources where stormwater is discharged. At the same time, however, regulators have identified irrigation return flows as a nonpoint source issue even though these waters are often discharged from obvious conveyances.

As with all forms of nonpoint source (NPS) water pollution, agricultural contaminants begin to create impacts when they are transported to surface waters by rainfall runoff or percolated into the ground by rainfall infiltration. What is also typical is that these pollutants often are not traceable to a particular site. Pollutants from agriculture may include sediment, nutrients, chemicals, salts, organic matter and bacteria. Agricultural runoff introduces these pollutants into the receiving waters in three ways: suspended in the runoff, dissolved in it, or attached to sediment particles. The U.S. Environmental Protection Agency has identified the following agricultural sources of nonpoint source pollution:

- non-irrigated crop production
- irrigated crop production
- specialty crop production (such as orchards and truck farms)
- pastureland
- rangeland
- feedlots
- aquaculture, and
- animal holding/management areas

Agriculture and silviculture, which involves the development and care of forests, are often lumped together as the key sources of "non-urban" nonpoint source water pollution that still require more focused and effective regulation. But it is the amount of land devoted to these activities, especially with modern production capabilities, that makes the

rural nonpoint source problem so challenging. Pollution in these areas is the cumulative result of hundreds upon thousands of acres being washed by rainwater.

Runoff from livestock activities remains a secondary concern in rural areas compared to the impacts of agricultural chemicals. Fears about these products were heightened when, after years of extensive application in farming operations, pesticides began to turn up in groundwater in many parts of the country. The contamination risk is especially damaging in rural areas since farmers rely on groundwater for drinking water and for irrigation, which is the highest-volume use of water in these areas. Certain aspects of Texas agriculture increase the threat to groundwater even more. Foremost among these is the extent of pesticide use in the state. Texas also is among the highest-ranking states in acres of irrigated farmland. Finally, there is the dilemma of attempting to restrict pesticide use despite its clear benefits in certain regions and with particular crops -- especially as significant a Texas cash crop as rice.

Some observers are optimistic that agricultural research and modernization will reduce future concerns about agricultural runoff. For example, newer pesticides are proving equally effective at lower application rates. Even in rice production, studies have shown that recirculation of irrigation water reduces the concentration of pollutants in the eventual discharge or runoff.

Nature of the Problem at Christmas Bay

Roughly sixty percent of the Christmas Bay watershed is devoted to agricultural uses. In addition, Brazoria and neighboring Galveston County lie at the center of the "Texas Rice Belt," which stretches from Beaumont to Victoria. This coastal area is renowned for its ideal soils, plentiful rainfall, and zero-slope conditions. But intensive rice farming regions also are known for their agricultural runoff problems. This is because of the need for flooded fields in this type of cultivation.

The Brazoria County Health Department and field personnel for the Texas Water Commission have expressed concerns about the extent of pesticide and fertilizer use in the vicinity of Christmas Bay. But there are many other agricultural regions of Texas that have more pressing nonpoint source pollution problems, based on recent studies by the Texas Soil and Water Conservation Board (SWCB). The SWCB did not identify Christmas Bay as an NPS problem area in the *Nonpoint Source Water Pollution Assessment Report for the State of Texas* published in 1988. However, this assessment was based on existing data and knowledge, and water quality specialists are quick to point out that data on nonpoint source loadings to Christmas Bay and its tributaries remains scarce. It is possible that Christmas Bay may be studied more closely in future NPS studies. In the meantime, state and federal agencies urge the use of Best Management Practices to control the polluting aspects of agricultural activities.

Key Management Agencies

Texas Soil and Water Conservation Board (SWCB)

The Soil and Water Conservation Board is the lead state agency in developing nonpoint source management programs targeted specifically to agriculture and silviculture. The SWCB is better known as the designated agency for implementing state laws designed to protect and conserve soil resources. (The Board's federal partner in this effort is the U.S. Soil Conservation Service). The SWCB provides technical assistance to groups developing local soil management plans and standards for agricultural and silvicultural practices. These plans are usually the result of established contacts between private landowners and staff from the U.S. Soil Conservation Service, the U.S. Agricultural Stabilization and Conservation Service, the Texas Agricultural Extension Service, and similar agencies. These programs were established for other reasons besides water quality protection, namely to respond to the "Dust Bowl" conditions of the 1930s, but they are in place and also help to reduce the potential for nonpoint source pollution.

A five-member elected State Board directs the SWCB. The state is divided into five "zones" for the purpose of electing these Board members. Each zone holds a convention to elect an individual to the Board, and each Board member represents his zone for a five-year term. Brazoria is the easternmost county in State Board Zone 3, with Zone 4 encompassing the remainder of the Galveston Bay system. SWCB staff are based at the agency's headquarters in Temple. The SWCB works closely with the state's 206 soil and water conservation districts. Christmas Bay is located within the Waters Davis Soil and Water Conservation District (SWCD 318), which has a District Conservationist based in Angleton. (District conservationists assigned to soil and water conservation districts are U.S. Soil Conservation Service employees.) Procedures for conservation planning and technical assistance to individual landowners are implemented through the local districts.

The state's first comprehensive soil conservation law was passed in 1939. Amendments made in 1941 created the State Soil and Water Conservation Board and authorized the establishment of local soil and water conservation districts. With the codification of the state's agricultural statutes in 1981, the soil and water conservation laws became part of the Texas Agriculture Code. During the SWCB's sunset review process in 1985, the 69th Legislature added Section 201.026 to the Agriculture Code. This section gives the SWCB responsibility to "... plan, implement, and manage programs and practices for abating agricultural and silvicultural nonpoint source pollution." The state's soil and water conservation districts had requested this leadership role for the State Board. They noted the agency's contributions to BMP development and reduction of nonpoint source pollution from agricultural and forest lands. Under the Texas Agricultural and Silvicultural Nonpoint Source Management Program, the SWCB focuses on those polluted water bodies which receive little or no impacts from urban and industrial development.

The SWCB was among several agencies and private contractors that helped the Texas Water Commission to prepare the *Nonpoint Source Water Pollution Assessment Report*

for the State of Texas in 1988, as required by Section 319 of the Water Quality Act of 1987. The study was designed to assess human-induced effects on state waters. The SWCB focused on these impacts in the state's agricultural and silvicultural regions. The SWCB also played an important role in meeting the second mandate placed on the states by the Water Quality Act: preparation of a statewide nonpoint source management program. The SWCB will be involved in ongoing and increasingly comprehensive state-level efforts to address nonpoint source pollution in Texas.

Texas Water Commission (TWC)

In its role as the state's principal water quality agency, the Texas Water Commission must view agricultural runoff as only one of a variety of factors that can undermine the attainment of state water quality standards. Like the U.S. Environmental Protection Agency, the Water Commission has taken steps to regulate certain agricultural activities with clear water quality impacts. But a comprehensive approach to nonpoint source regulation in Texas, including agricultural NPS, still must be finalized and implemented.

TWC's Water Quality Standards and Evaluation Section is the focal point for statewide management planning and water quality monitoring in Texas. The Section must use its own data resources and the monitoring results of the U.S. Geological Survey Monitoring Network to identify and evaluate potential NPS "hotspots" in the state. The Section is part of the Water Quality Division, which also oversees permitting and enforcement of point source discharges. TWC's Groundwater Conservation Section, which is within the Water Rights and Uses Division, supports the work of the Texas Groundwater Protection Committee. This inter-agency working group developed a Groundwater Protection Strategy for the state, including BMP refinement, data collection priorities, public education programs, and enhancement of technical knowledge among agency staff. The Water Quality Division and the Water Rights and Uses Division are two of six regulatory divisions within TWC that report to the agency's Executive Director. Agency policy, implementing rules, and regulatory decisions are the responsibility of the three-member Texas Water Commission. The Commissioners are appointed for six-year terms by the Governor with the advice and consent of the Texas Senate.

TWC coordinated the state's response to the nonpoint source mandates of the federal Water Quality Act of 1987. With assistance from a number of other agencies, including the Texas Soil and Water Conservation Board on agricultural and silvicultural issues, TWC completed the *Nonpoint Source Water Pollution Assessment Report for the State of Texas* in 1988. This report and a proposed nonpoint source management program for the state were submitted to EPA for its review and approval. TWC concluded in its reports that the state does not face a *critical* nonpoint source problem if the NPS risk is weighed in terms of its immediate potential harm to human health. However, nonpoint sources of pollution are a concern to the extent that they prevent the attainment of state water quality standards, impair anticipated water uses, and damage biological productivity and habitat quality. This was nothing new to TWC, which has been considering nonpoint source impacts and solutions since the zenith of water quality management planning in the 1970s (under Section 208 of the Clean Water Act).

While TWC has relied on the Texas Soil and Water Conservation Board to develop Best Management Practices for agriculture and silviculture, the Texas Water Code authorizes TWC to develop its own rules for confined animal feedlots, such as those used in cattle and poultry production. The program is guided by an overall "no discharge" policy. This means that all wastes and wastewater from concentrated animal feeding operations must be retained and used or disposed on agricultural land rather than being discharged into state waters. Smaller operations are regulated by rule while larger ones require a TWC permit. The regulations also include specific provisions for the protection of ground and surface water.

Since 1988, the Texas Surface Water Quality Standards maintained by the TWC have included an "antidegradation" policy that spells out how the Commission will proceed when presented with proposed actions that would increase pollutant loads to state waters. The policy mainly focuses on discharges that have the potential to impair existing stream uses or water quality, but it also calls for cost-effective and reasonable BMPs to address nonpoint sources of stream degradation.

TWC and the Texas Department of Agriculture both have regulatory authority over the storage and disposal of pesticide wastes. The Texas Solid Waste Disposal Act resulted in TWC rules prohibiting the storage, processing or disposal of pesticide waste in any way that might threaten either the state's waters or the public health and welfare. In its role as state regulator of hazardous waste, TWC has authority over those unused pesticides and rinse waters that are classified as hazardous waste under state and federal laws. This allows TWC to take steps to protect surface and groundwater, primarily by insuring that pesticides are handled and disposed according to label directions, and also by focusing on the largest-volume pesticide applicators. Some pesticide investigations undertaken by the TWC have been funded by EPA with Superfund monies.

Texas Department of Agriculture (TDA)

The Texas Department of Agriculture administers the state's pesticide and herbicide regulations. These are authorized by the Texas Pesticide Control Act and the Texas Herbicide Law, both of which are part of the Texas Agriculture Code. The statutes enable TDA to undertake comprehensive regulation of pesticides, including their registration (through TDA's Pesticide Registration Program) and use.

The department is directed by the elected Texas Commissioner of Agriculture. Environmental matters are handled by TDA's Office of Natural Resources. The Coastal Bend District Office, based in Houston, oversees TDA programs in the region which includes Christmas Bay.

TDA has the authority to restrict pesticide use to prevent unreasonable human or environmental impacts, especially those affecting groundwater. In its evaluation of pesticides, TDA also must consider social and economic factors. Aside from use restrictions, TDA may issue advisories or impose tougher labeling requirements. TDA

supervises the licensing of agricultural chemical dealers and applicators, and these individuals must comply with state record-keeping and administrative requirements. TDA takes enforcement action when investigations show that agricultural chemicals have been improperly handled, applied or disposed. Penalties can vary from civil penalties to imprisonment for the most serious violations. The Environmental Protection Agency monitors and supports state enforcement efforts under a Pesticide Enforcement Cooperative Agreement with TDA. This federal/state coordination is authorized by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).

Both TDA and the Texas Water Commission are authorized to regulate the storage and disposal of pesticide wastes. TDA rules prohibit storing or disposing of "any pesticide or pesticide container in a manner that may cause or result in injury to humans, vegetation, crops, livestock, wildlife, pollinating insects, or pollution of any water supply or waterway." TDA has developed groundwater protection rules for certain pesticides, and EPA has backed the department when it has suspended the use of particular pesticides until further studies on groundwater impacts are done.

TDA has sponsored a number of other initiatives in recent years tied to water quality. Surveys of pesticide use and examination of agricultural techniques and their groundwater impacts have led to improved pesticide regulation and development of Best Management Practices. This work was facilitated by training seminars for TDA's pesticide investigators to teach them field sampling techniques. TDA also has its own pesticide laboratories to support agency research efforts. TDA based its Rural Drinking Water Monitoring Project on EPA's National Pesticide Survey, looking for evidence of pesticide impacts and gaps in drinking water regulation, such as for private wells in rural areas. In 1987, TDA established the Groundwater Technical Advisory Group, which includes representatives from the Texas Water Development Board, the Texas Department of Health, the Texas Water Commission, the U.S. Geological Survey and other organizations, to do studies in targeted areas.

TDA's Pest Management Program has been promoting the idea of "Integrated Pest Management" in Texas. The program urges pesticide users to overcome the cycle of introducing new products and then watching as pests gradually develop resistance to the latest chemical mix. TDA staff supply information on the range of alternatives for pest management. The program acknowledges that pesticides are still the "best" option in some situations. But it tries to demonstrate how other control strategies and technologies can be more effective, safer, and even less expensive under certain conditions.

U.S. Environmental Protection Agency (EPA)

EPA plays a role in this regulatory area through its usual oversight and guidance of state water quality management efforts, as well as through its direct regulation of pesticides. Agricultural runoff is only one area of EPA concern under the broad umbrella of nonpoint source water pollution. EPA also supports state and local runoff controls through the various nonpoint source funding programs it administers.

Agricultural runoff is a high priority for EPA's Office of Groundwater Protection. The Office is part of the Water Management Division of EPA Region 6 in Dallas. The Office is responsible for EPA's Groundwater Protection Strategy, which includes wellhead protection programs. The Water Management Division also assigns a Nonpoint Source Coordinator to monitor the entire spectrum of nonpoint source water pollution issues, including agricultural runoff. The Coordinator is based in the State Programs Section of the Water Quality Branch. EPA's involvement in pesticide regulation is focused in the Pesticides and Toxics Branch of the Air, Pesticides and Toxics Division. This Division and the Water Management Division are two of the four regulatory divisions which report to the Administrator of Region 6. Region 6 covers Texas, Louisiana, Arkansas, Oklahoma and New Mexico. EPA's ten regional administrators report to the agency's Administrator, based at EPA headquarters in Washington, D.C. The Administrator of EPA and a Deputy Administrator are appointed by the President with the advice and consent of the U.S. Senate.

EPA reviewed the findings and data collected by the states for their statewide nonpoint source assessments, which were mandated by the Water Quality Act of 1987. EPA also must evaluate the nonpoint source management programs developed by each state based on the assessment. EPA sees the Texas Soil and Water Conservation Board (SWCB) as the key agency in Texas for agricultural and silvicultural nonpoint source management. EPA also anticipates the involvement of the Texas Water Commission, the Texas Department of Agriculture, the Texas Agricultural Extension Service, and local soil and water conservation districts. The U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department will be involved in terms of their ongoing monitoring and study of pesticides and other agricultural impacts on fish and wildlife.

Under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), EPA oversees the registration and use of pesticides, as well as certifying pesticide applicators. The objective of the registration process is to minimize the human and environmental impacts of those pesticides allowed on the market. As in many other areas of federal regulation, EPA provides funding support and guidance to state pesticide control programs. As provided for by FIFRA, EPA also has a Pesticide Enforcement Cooperative Agreement with the Texas Department of Agriculture. This agreement allows for closer coordination between EPA and the state and also establishes work programs for pesticide enforcement and protection of groundwater and endangered species.

EPA's research efforts provide another form of support for state nonpoint source programs. Foremost among this research in the area of agricultural runoff was EPA's National Pesticide Survey, which EPA completed with assistance from state agencies. Surface and groundwater contamination was the focus of this survey, and EPA's model study techniques have since been replicated by the Texas Department of Agriculture.

Management Evaluation Findings

1. *Monitoring of agricultural runoff impacts -- and of nonpoint source pollution in general -- is inadequate, largely because of insufficient funding and also because of the relative newness of nonpoint source management strategies.*

Agency staff emphasize that there is no comprehensive monitoring of groundwater in Texas. The Texas Department of Health does some sampling, as does the Texas Water Development Board (TWDB). The TWDB also has participated in some joint monitoring projects with the Texas Department of Agriculture (TDA). TWDB's Water Availability and Studies Section actually supervises a statewide ambient groundwater monitoring program that has gathered considerable data on groundwater in rural areas. But agencies concerned with general water quality (versus drinking water quality) say that this data is not appropriate for their needs because it is collected at wells and similar points, reflecting the water supply orientation of the TWDB. These agencies need monitoring data that will help them to trace pesticide impacts and other agricultural runoff factors. But the necessary work is too costly, both in the field and especially in the laboratory. The Texas Department of Agriculture has found evidence of groundwater contamination in some areas through its limited studies. But TDA does not have sufficient resources to do the extensive groundwater studies and protection projects that it sees a need for in rural areas.

The Texas Soil and Water Conservation Board (SWCB) is attempting to develop a monitoring program specifically for agricultural and silvicultural nonpoint source impacts. The limited data that the SWCB currently gathers on ground and surface water impacts is the result of coordinated efforts with the Texas Water Commission. This data is shared with the Texas Groundwater Protection Committee and the U.S. Environmental Protection Agency (EPA). SWCB staff say that funding is the key constraint to a more effective monitoring system. The problem in the past was that traditional monitoring programs did not collect the type of data needed to evaluate nonpoint source loadings properly. Now that the agencies are better prepared and know how they want to proceed, they are discovering that funding for targeted monitoring is "almost non-existent."

The State Agricultural and Silvicultural Nonpoint Source Management Program headed by the SWCB will continue to require the help of other water quality monitoring entities to acquire needed data. Unfortunately, even the state's lead water quality agency, the Texas Water Commission, says that it does not yet have sufficient data on nonpoint source loadings into Christmas Bay.

Some individuals conclude that monitoring, while costly, will be needed under any nonpoint source management scenario: either to target critical problem areas, or to prove to the EPA that there is no significant nonpoint source problem, if that is the position to be taken by the state.

2. *Management agencies remain cautious about nonpoint source control strategies because of a continuing "knowledge gap."*

Because of their reliance on sometimes inadequate and inappropriate data, and due to the complexity of the nonpoint source pollution problem, involved agencies say that they still have much to learn about the extent and impacts of agricultural pollution. Agency managers are demonstrating their concern for "regulatory effectiveness" by demanding a better understanding of the problem before committing public funds to relatively new pollution control strategies. Nonetheless, some agency staff point to documented solutions to specific problems which indicate that immediate and effective actions are possible.

A massive nonpoint source research and dissemination effort continues across the nation. This has resulted in improved Best Management Practices and greater expertise among state and federal agency staff. Most important to agency managers is that their nonpoint source management programs show evidence of water quality improvement.

3. *Irrigation return flows are a source of agricultural runoff that still must be brought under regulatory control.*

Irrigation return flows are currently exempted from discharge permit requirements under Section 402(l) of the Clean Water Act. Some agency staff highlighted this exemption as a key gap that prevents more effective regulation of agricultural runoff.

4. *A basic management framework for addressing agricultural nonpoint source pollution is in place, although there sometimes is uncertainty as to whether water quality agencies or agriculture agencies should take the lead.*

The Texas Soil and Water Conservation Board (SWCB) intends to work with the existing management framework for soil conservation that has been developed in Texas over the last fifty years. This system is well-established, successful, and also is considered an appropriate mechanism for implementing agricultural nonpoint source controls. The existing agencies, techniques, and Best Management Practices to prevent soil erosion also can be applied to nonpoint source prevention.

SWCB staff are seeing the rewards of fifty years of developing effective working relationships between such key agencies as the U.S. Soil Conservation Service, the U.S. Agricultural Stabilization and Conservation Service, local soil and water conservation districts, the Texas Water Commission, the Texas Agricultural Extension Service, the Texas Agricultural Experiment Station, and the Texas Forest Service. The SWCB continues to promote such cooperation through its Nonpoint Source Coordinating Committee. But the SWCB plans to go beyond this soil and water conservation network to maximize the number of farmers and rural

landowners that can be brought into a statewide nonpoint source control effort for agriculture.

SWCB staff say that what is needed now is adequate funding to support agricultural and silvicultural management efforts. They also call for improved priority-setting within the management agencies to insure optimal use of existing funds.

5. *Sediment loadings will continue to be addressed through erosion control programs, but they are not a high priority of nonpoint source programs aimed at agricultural runoff.*

The Texas Soil and Water Conservation Board (SWCB) views agricultural chemicals and other forms of runoff as more threatening aspects of rural nonpoint source pollution than sediment. Sediments are known to be one pathway for dispersed pollutants to reach surface water. But the SWCB believes that seemingly high sediment loadings are a natural occurrence in many Texas streams and that local ecosystems have adapted. There is also the challenge of trying to locate the source of sediments and distinguish local man-made sources from natural streambank erosion and other upstream impacts.

The SWCB prefers to concentrate its resources where sediment impacts are traceable and where excessive sediment is known to be impairing water uses. Best Management Practices are seen as the best strategy for limiting sediment generation from agricultural land uses, just as BMPs are used to reduce the off-site impacts of urban construction. But the involved agencies again face the problem of inadequate data to pinpoint sources and assess impacts. This is especially important, they emphasize, because erosion does not necessarily result in polluted water.

6. *The Texas Soil and Water Conservation Board has made substantial progress toward identifying Best Management Practices that are effective in controlling the nonpoint source impacts of agriculture and silviculture.*

The SWCB and the various extension and outreach agencies have a good reputation among rural landowners and elected officials because of their effective grass-roots efforts in soil erosion control. As mentioned elsewhere, traditional soil conservation practices are seen as broadly transferrable to nonpoint source prevention as well. Methods already exist to reduce erosion and runoff, and improved application of agricultural chemicals and fertilizers also is addressed. The involved agencies say it is simply a matter of sponsoring more extensive implementation of BMPs and public education programs in rural areas.

Since the early 1980s, the SWCB has touted nearly 70 soil and water conservation practices that also may be used to abate nonpoint source pollution. These BMPs are contained in the agency's *Statewide Control Strategy for Agricultural Nonpoint Source Pollution in Texas*. There are basically three categories of BMPs: runoff controls, sediment controls, and actual changes in the use or management of

potential pollutants on the land surface. SWCB staff hope to update the BMPs to reflect new research findings and proven techniques. They also see a need for local nonpoint source planning and site-specific strategies that adapt general pollution control principles to local physical and economic conditions. Local entities also can assist in identifying emerging generators of nonpoint source pollution, such as a new business or an evolving use of agricultural land. These local agencies should then take the lead in convincing new sources to institute BMPs in their activities.

7. *The effectiveness of management programs for agricultural runoff ultimately depends on the cooperativeness of rural landowners.*

As with all types of nonpoint source regulation, it is the polluting behavior of individuals that must be influenced in order to make gains. Agency staff say that the agricultural community is increasingly aware that its practices are contributing to water quality problems and must be improved. But talk of land use controls is counter-productive, with increasing resistance the farther one travels from cities. Such controls are seen as going far beyond environmental regulation and interfering with the basic rights of property owners. The staff emphasize that a voluntary partnership for land management already exists between agricultural landowners and the various outreach agencies. They say that effective management of nonpoint source impacts in rural areas will require more extensive follow-up of BMP implementation, expanded technical assistance, ongoing public education, and continued coordination between the involved agencies. An underlying concern is the financial capacity of some landowners to implement appropriate controls.

The key in working with landowners is flexibility and presentation of options and alternatives. Staff also stress that the agricultural community is not a homogenous group, so regulatory initiatives should not treat it as such. A grass-roots, face-to-face approach is still the best technique. The involved agencies hope to take advantage of existing contacts: farm bureaus, conservation districts, County Extension Agents, and others who are familiar to the agricultural community and are knowledgeable about local conditions. The agencies also are urging private organizations and individuals to take pre-emptive pollution control steps on their own. Otherwise, rural landowners may face even more costly regulation, potential restrictions on pesticides and other agricultural chemicals, and large-scale retention requirements for irrigation waters. The staff say that awareness of this need is high, especially as rural residents come to appreciate that contaminated water supplies can place their health and livelihoods at risk.